

(*Entomologists' Monthly Magazine*, xii. p. 252) that the net may be used over miles of grassy mountain-slopes without finding a single flower-frequenter, or anything approaching to it. Under these conditions, it is not to be wondered at that Mr. Melliss's account of the island, not long ago reviewed in *NATURE*, should, as not representing the work of an expert, have failed adequately to represent its peculiar coleopterous features. Of the 203 species above mentioned, fifty-seven have undoubtedly been conveyed to the island through various external media, and have since established themselves—many of them, indeed, being the regular followers of civilisation. Seventeen of the remainder possess doubtful claims to be considered indigenous, or even to have been taken in St. Helena at all. Of the 129 species left, and which may be safely deemed endemic, the distribution is highly eccentric. Whole groups, hitherto regarded as well-nigh cosmopolitan, are either entirely absent or barely represented; and one section, the weevils, is most unduly exaggerated, especially in one of its families. The missing divisions are water-beetles (both *Hydradeephaga* and *Philhydrida*—the aquatic *Curvovora* and *Herbivora*), and *Longicornia*; and their absence is the more noteworthy, as proper natural conditions exist for both of them; and, as to the latter, other wood-feeders have inordinately increased and multiplied. The *Necrophaga* (a wide term, covering many families of universal distribution, including bone-, skin-, and fungus-feeders, acting as natural scavengers, and whereof we have, even in Great Britain alone, over 450 species) and *Trichopterygia* have each but a single representative. The *Pseudotrimeria* (*Coccinellidae*, &c.) and *Lamellicornia* can each only supply two. As to the former of these groups, Prof. Westwood has well observed that the inference is a want of *Aphides* and other plant-lice, on which lady-birds are the natural parasites; and on this point it would be interesting to know if the usual Homopterous vegetable-feeders are really wanting. If not indigenous they might be readily introduced; and, enumerating even the avowedly introduced *Pseudotrimeria* in Mr. Wollaston's list, we find only four species to keep them down, since the *Corylophidae* and *Erotylidae* included in the group by the author cannot be reckoned. As to the *Lamellicorns*, the want of indigenous mammals would readily account for the absence of such of them as feed on the excreta of those animals (*two* only, both introduced, can be found; here Baron von Harold would assuredly perish of inanition!); but the mighty tropical clan, revelling in rotten wood, should surely in such a latitude, with the decaying forests of centuries for pabulum, have reared more than the miserable tale of four, whereof but two are autochthones! Next in number come the *Priocerata* and *Phytophaga*, respectively counting but three. The *Elaterride* and *Anobiidae*, essentially wood-feeders, are the only families of the first of these that provide indigenous species: how they have failed to produce more is incomprehensible. The fact of plant-feeding beetles being of the greatest scarcity has been already quoted from the author himself, and is equally unintelligible. The *Staphylinidae* and *Heteromera* each supply six indigenous forms, the paucity of the latter being perhaps accounted for by the lack of those sandy wastes peculiarly affected by so many of its members. Next in importance come

the *Geodephaga*, or land carnivorous beetles, whereof as many as fourteen (in fact all but one, and of them no less than eleven here described as new) are recorded. Here, again, the peculiarity of the island is emphasised, as the eleven new species, all of the genus *Bembidium*, depart widely from the shingle-, mud-, and marsh-frequenting habits of that vast and widely distributed genus, occurring as they do in the high central mountain ridges, and living inside the fibrous stems of rotten tree-ferns, an unexpected habitat as strange as that recorded in the Horatian lines:—

“Piscium et summa genus hæsit ulmo,  
Nota quæ sedes fuerat columbis.”

These arboreal Bembids have necessitated the creation of three new sub-genera, distinguished by abnormally minute eyes, want of wings, rounded outline, fossorial legs, and moniliform antennæ; and would alone have been sufficient to have stamped the fauna as *sui generis*.

Last, and most important, come the *Rhynchophora* or weevils, with no less than ninety-one representatives, more than two-thirds of the whole number. These again are represented in unusual proportions, the *Cossonidae* numbering fifty-four, two-fifths of the entire fauna (we have in England but nine, out of 3,000 species), and the *Anthribidae* twenty-six. The conclusion derived by the author is, that, as these weevils unquestionably represent the dominant autochthonous family, and all (but one) are of lignivorous habits, St. Helena may be pictured in the remote past as a densely-wooded island, in which they performed their natural functions of tree-destroyers among tree-ferns and *Compositæ* on a gigantic scale, unaided by the usual timber-eaters. The well-nigh complete destruction of indigenous trees in modern times has no doubt been accompanied by the loss of many a link in the aboriginal chain of these peculiar forms. Those that still survive are of such eccentric structure and facies that the creation of eleven new genera and forty new species has been necessitated for their reception in the present work, which, had it been the sole production of its author, would have effectually prevented his name from passing into oblivion.

E. C. RYE

#### LETTERS TO THE EDITOR

- [The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]
- [The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

#### Oxygen in the Sun

ATTENTION having recently been directed by Dr. Schuster and Mr. Meldola, in connection with my discovery of oxygen in the sun, to the location of the oxygen, it may be of interest to allude to some experiments to determine the question by direct observation of the image of the sun spectroscopically. For this purpose I used a spectroscope furnished with a very fine grating on silvered glass given to me by Mr. Rutherford. This grating of 17,280 lines to the inch can be arranged to give a dispersion equal to twenty heavy flint glass prisms. The spectroscope was attached to my 12-inch Clark refractor, and I employed the full aperture of this telescope to produce an image of the sun on the slit. It did not seem practicable to use the spectroscope on the 28-inch Cassegrain reflector in this research, because the tremulousness of the air was usually too great, the image of the

sun being magnified to five inches in diameter. Even with the 12-inch refractor the occasions suitable for a critical examination are rare.

In front of the slit I also brought the terminals of the secondary circuit of an induction coil, which were connected with a Leyden battery. The current through the primary wire of the Ruhmkorff was furnished by a Gramme machine. This arrangement permitted the production of a strong oxygen spectrum near the spectrum of the sun's limb.

The most obvious point to determine was whether the oxygen lines visible in the spectrum of the solar disc projected beyond the apparent limb of the sun as seen in the spectroscope; in other words, whether oxygen could be detected in the lower parts of the chromosphere. For this purpose I looked particularly at the bases of the prominences. I saw a large number of reversed lines, including some of the more delicate lines of Young's preliminary catalogue, but on no occasion could I be sure that the oxygen lines were seen outside of the limb. Of course, unless such an observation could be made in a perfectly tranquil atmosphere, certainty could not be attained. The experiments were terminated temporarily on account of getting my right arm caught in the engine, but they will probably be resumed next summer.

On examining Prof. Young's catalogue of chromosphere lines made at Sherman Station, in the Rocky Mountains, it appears that he does not note the great oxygen group near G, and as his observations were made with remarkable accuracy and care, this would tend to corroborate the view that the bright-line spectrum of oxygen as seen on the sun's disc must have its upper limit close to the apparent spectroscopic limb of the sun.

HENRY DRAPER

Observatory, Hastings-on-Hudson, New York, January 28

#### Brain of a Fossil Mammal

IN NATURE (vol. xvii. p. 222) is an account of some remarkable characters of the brain of *Coryphodon*, as determined by Prof. Cope, and recently published in the *Proceedings of the American Philosophical Society*, vol. xvi. It may interest some of the readers of NATURE to know that the subject had been previously investigated by the writer, who published a description and figures of the brain cast of *Coryphodon* in the *American Journal of Science*, vol. xi. p. 427, May, 1876, more than a year before the article above quoted appeared. Prof. Cope made no reference to my paper, although perfectly familiar with it. His figures moreover do not represent, even approximately, the brain of *Coryphodon*, owing to serious errors in his observations, which were based upon an imperfect specimen, as I have shown elsewhere (*American Journal of Science*, vol. xiv. p. 83). One of the most glaring of these errors is seen in the supposed olfactory lobes which, as figured, include no small part of the nasal cavities, and naturally add a very remarkable feature to this brain cast. The specimens from which my figures and description were taken are in excellent preservation, and are in the Yale College Museum, where they have been examined by Prof. Huxley and many other anatomists.

The attention called by NATURE to this paper of Prof. Cope's makes the present correction seem necessary for English readers, especially as the paper quoted is a typical one, illustrating the methods and work of its author.

O. C. MARSH

Yale College, New Haven, Conn., February 7

#### Origin of Tracheæ in Arthropoda

IN NATURE (vol. xvii. p. 284) is a notice of a work by Dr. Palmen, of Helsingfors, on the morphology of the tracheal system. From the wording of the notice it appears as if the views of Dr. Palmen as to the origin of tracheæ from skin-glands, and as to the importance of *Peripatus* as an ancestral form of the Tracheata, were new to science. I was, to the best of my belief, the first to discover that *Peripatus* was provided with tracheæ; and in a paper on the structure and development of *Peripatus capensis*, published in the *Phil. Trans.* for 1874, I discussed the question of the origin of tracheæ, and put forward exactly similar views to those cited in your notice. These views have been adopted by Prof. Gegenbaur in his new edition of his "Grundriss der Vergleichenden Anatomie" (1878), in so far at least as that *Peripatus* is placed in a separate division of the Arthropoda, "the Protracheata." Haeckel, following Gegenbaur, supposed his Protracheata to have been provided with tracheal

gills, but the diffuse arrangement of the tracheæ in *Peripatus* led me to conclude that the ancestral tracheata were terrestrial, and not aquatic, in habit, and that tracheal gills were comparatively late developments.

I am very glad to find that Dr. Palmen has arrived at similar results. Unfortunately, the place of publication of his treatise is omitted from your notice. It would be of value if you saw fit to append the reference as a note to the present letter.

Exeter College, Oxford

H. N. MOSELEY

[Dr. Palmen's paper was published in Helsingfors.—ED.]

#### The "Phantom" Force<sup>1</sup>

##### III.

WHILE very clearly establishing that it is to the force urging a body that the potential energy which the body *has not*, but can have, must properly be assigned, and calling it very appropriately the "energy of tension,"<sup>2</sup> a very apposite remark (which I do not remember to have met with before) is added by "X" in his concluding paragraphs. The body could not command this "force-work" in any position unless it had *been put* into the proper position to command it; and the *actual energy* spent in putting it there is the "energy of tension" which, although forfeited to the force, *it can* reclaim. In this view it is not surprising that potential energy should have the same terms for its measurement as actual energy, since it is nothing but the actual energy which the body, or some agent operating upon it, has really lost; and if we pass from permanent forces to those ephemeral ones which physical agents can produce on an already existing arrangement of bodies, then, according to the existing configuration of the bodies when the force is generated, and in proportion to the "potential," or to the available statical energy developed, so is the work of the agent used to bestow this energy. In these cases of temporary "potentials" the actions are not actions at a distance, but through an intermediate medium, it may be strung with motion, and with permanent forces, which have absorbed the work applied to put the intervening medium, as it were, on the stretch, and to develop the ephemeral energy of tension. But we recognise this very clearly (as for instance in charging well-insulated electrical conductors) only in the rare cases of reversible arrangements. The fatigue and exhaustion which we soon feel when holding out at arm's length a heavy weight (although we do no work upon the weight) arises, for example (like that of a galvanic battery exciting an electro-magnet and supporting a heavy armature), from two causes, the first of which, the excitation of the magnet and armature, and the tightening of the muscles, or producing the requisite statical energy for the occasion, absorb but a small portion of the work. The main expenditure is "frittered away" (a most expressive description of the process, which I owe to Prof. Tait) in aimless and random paths as heat, by the wasteful process of electrical or muscular currents afterwards kept up to maintain the excitation.

I have thus far sketched out a general view of physics (one which is perfectly adapted to satisfy its general requirements), in which self-balancing actions and reactions, only depending in intensity on the distance between their centres are supposed to be permanently implanted in pairs of material particles, a special case, or fresh assumption regarding the general system of forces contemplated in the Newtonian theory of mechanics, which either may, or may not be the complete theory of their action, but which assists the mind very greatly, by giving them a mechanical explanation, in forming true and correct preliminary notions of the two leading laws of the great modern science of energy. And here I may take the opportunity to mention that my own views of the relationship of modern physics in its various mutually dependent branches to that famous foundation of mechanics which Newton laid (or perhaps I should rather say, since the supremacy of mechanics is by no means yet conceded, of the Newtonian basis of mechanics to modern physics) have been mainly imparted and completed by a perusal of the excellent little manual on "Matter and Motion" by Prof. J. Clerk

<sup>1</sup> Continued from p. 322.

<sup>2</sup> The term "statical energy" introduced by Sir W. Thomson (see a note in Prof. Tait's "Sketch of Thermodynamics," p. 52), and now proposed (NATURE, vol. xvi. p. 521) by "W. P. O." to be substituted for the above, is of all the phrases yet used to denote it, the truest and simplest description of its real character. That it appertains to the force and not to the body is apparent both from this name and from the definition (which I have endeavoured to illustrate) that it is the "work" of the "agent," a property or possession of *that individual*, equal and opposite to, but *not the same* as its "net," or effected work.